Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1-6. (cancelled)

7. (Currently Amended) A method ~~of gradual deformation of~~ for forming a representation generated by sequential simulation, of a stochastic model, which is not limited to a Gaussian stochastic model, of a physical quantity z in a heterogeneous medium, in order to constrain the stochastic model ~~which is not limited to a Gaussian stochastic model to a set of~~ to data collected in the heterogeneous medium by means of previous measurements and observations, relative to a state or the structure ~~thereof~~ of the heterogeneous medium, comprising applying a stochastic model gradual deformation algorithm to a Gaussian vector (Y) with N mutually independent variables that is connected to a uniform vector U with N mutually independent uniform variables by a Gaussian distribution function (G), so as to form a chain of realizations u(t) of vector U, and using ~~these~~ the chain of realizations u(t) to generate realizations z(t) of the physical quantity that are adjusted to the data~~.~~; and

using the representation to study the medium.

8. (Currently Amended) A method as claimed in claim 7, wherein:

~~a~~ the chain of realizations u(t) of the vector (U) is defined from a linear combination of realizations of the Gaussian vector (Y) comprising combination coefficients with a sum of squares of the coefficients being one.

9. (Currently Amended) A method as claimed in claim 7, comprising:

gradually deforming the stochastic model, which is not limited to a Gaussian stochastic model representative of the heterogeneous medium, simultaneously in relation to the structural parameters and to ~~the~~ random numbers.

10. (Currently Amended) A method as claimed in claim 8, comprising

gradually deforming the stochastic model, which is not limited to a Gaussian stochastic model representative of the heterogeneous medium, simultaneously in relation to the structural parameters and to ~~the~~ random numbers.

11. (Currently Amended) A method as claimed in claim 7, comprising:

performing a separate gradual deformation of a number n of parts of the stochastic model, which is not limited to a Gaussian stochastic model representative of the heterogeneous medium, while preserving continuity between the parts of the stochastic model, not limited to a Gaussian stochastic model representative of the heterogeneous medium by subdividing the uniform vector U into n mutually independent subvectors.

12. (Currently Amended) A method as claimed in claim 8, comprising:

performing a separate gradual deformation of a number n of parts of the stochastic model, which is not limited to a Gaussian stochastic model representative of the heterogeneous medium, while preserving continuity between the parts of the stochastic model, not limited to a Gaussian stochastic model representative of the heterogeneous medium by subdividing the uniform vector U into n mutually independent subvectors.

13. (Currently Amended) A method as claimed in claim 9, comprising:

performing a separate gradual deformation of a number n of parts of the stochastic model, which is not limited to a Gaussian stochastic model representative of the heterogeneous medium, while preserving continuity between the parts of the stochastic model, not limited to a Gaussian stochastic model representative of the heterogeneous medium by subdividing the uniform vector U into n mutually independent subvectors.

14. (Currently Amended) A method as claimed in claim 10, comprising:

performing a separate gradual deformation of a number n of parts of the stochastic model, which is not limited to a Gaussian stochastic model representative of the heterogeneous medium, while preserving continuity between the parts of the stochastic model, not limited to a Gaussian stochastic model representative of the heterogeneous medium by subdividing the uniform vector U into n mutually independent subvectors.

15. (Currently Amended) A method in accordance with claim 7, wherein: the heterogeneous medium is an underground zone.

16. (Currently Amended) A method in accordance with claim 8, wherein: the heterogeneous medium is an underground zone.

17. (Currently Amended) A method in accordance with claim 9, wherein: the heterogeneous medium is an underground zone.

18. (Currently Amended) A method in accordance with claim 10, wherein: the heterogeneous medium is an underground zone.

19. (Currently Amended) A method in accordance with claim 11 wherein: the heterogeneous medium is an underground zone.

20. (Currently Amended) A method in accordance with claim 12, wherein: the heterogeneous medium is an underground zone.

21. (Currently Amended) A method in accordance with claim 13, wherein: the heterogeneous medium is an underground zone.

22. (Currently Amended) A method in accordance with claim 14, wherein: the heterogeneous medium is an underground zone.

23-26 Cancelled without disclaimer or prejudice.

27. (New) A method for forming a representation generated by sequential simulation, of a stochastic model, not limited to a Gaussian stochastic model, of a physical quantity in a heterogeneous underground formation, which is defined by a set of data collected in the underground formation by means of previous measurements and observations, comprising:

a) applying a stochastic model gradual deformation algorithm to a Gaussian vector with mutually independent variables that is connected to a uniform vector with mutually independent uniform variables by a Gaussian distribution function, so as to form a chain of realizations u of the Gaussian vector;

b) using the chain of realizations u to generate representations of the physical quantity:

c) iteratively modifying an objective function that measures misfit between data corresponding to representations of the stochastic model representing the physical quantity, and the data collected in the underground formation until obtaining a representation of the underground formation substantially fitting the data; and

d) using the representation to study the underground formation.

28. (New) A method as claimed in claim 28, wherein:

a chain of realizations u of the uniform vector is defined from a linear combination of realizations of the Gaussian vector with the combination coefficients such that a sum of squares of the coefficients is one.

29. (New) A method as claimed in claim 27, comprising:

gradually deforming the stochastic model representative of the underground formation with simultaneously modifying structural parameters of the stochastic model and random numbers.

30. (New) A method as claimed in claim 28, comprising:

gradually deforming the stochastic model representative of the underground formation with simultaneously modifying structural parameters of the stochastic model and random numbers.

31. (New) A method as claimed in claim 27, comprising:

performing a separate gradual deformation of a number n of parts of the stochastic model representative of the heterogeneous medium while preserving continuity between the number of parts of the stochastic model by subdividing the uniform vector into n mutually independent subvectors.

32. (New) A method as claimed in claim 28, comprising:

performing a separate gradual deformation of a number n of parts of the stochastic model representative of the heterogeneous medium while preserving continuity between the number of parts of the stochastic model by subdividing the uniform vector into n mutually independent subvectors.

33. (New) A method as claimed in claim 29, comprising:

performing a separate gradual deformation of a number n of parts of the stochastic model representative of the heterogeneous medium while preserving continuity between the number of parts of the stochastic model by subdividing the uniform vector into n mutually independent subvectors.

34. (New) A method as claimed in claim 7 wherein:

the physical quantity is permeability of the underground formation.

35. (New) A method as claimed in claim 7 wherein:

the measurements comprise geologic data.

36. (New) A method as claimed in claim 7 wherein:

the measurements comprise seismic data.

37. (New) A method as claimed in claim 7 wherein:

the measurements from wells in the heterogeneous medium comprise seismic data.

38. (New) A method as claimed in claim 37 wherein:

the measurements obtained from wells comprise time variation of pressure and flow rate of fluid from a reservoir.

39. (New) A method as claimed in claim 27 wherein:

the physical quantity is permeability of the underground formation.

40. (New) A method as claimed in claim 27 wherein:

the measurements comprise geologic data.

41. (New) A method as claimed in claim 27 wherein:

the measurements comprise seismic data.

42. (New) A method as claimed in claim 27 wherein:

the measurements from wells in the heterogeneous medium comprise seismic data.

43. (New) A method as claimed in claim 42 wherein:

the measurements obtained from wells comprise time variation of pressure and flow rate of fluid from a reservoir.